

**Ambidexterity in the Cellphone Industry: An Empirical Study of Asian Firms**

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## **ABSTRACT**

### **Ambidexterity in the Cellphone Industry:**

#### **An Empirical Study of Asian Firms**

Weichen Wang

Leveraging a hybrid research approach between quantitative and qualitative methods, the present research project intended to investigate 1) in the Chinese cellphone market, the difference in level of organizational ambidexterity exhibited by East Asian and Non-East Asian manufacturers, and 2) whether there exists a positive correlation between cellphone manufacturers' market performance and organizational ambidexterity. This study drew from He & Wong's (2004) framework of a dual-dimensioned organizational ambidexterity which includes the Balance Dimension (BD) that describes a balanced effort in organizational exploitation and exploration, and the Combined Dimension (CD) that describes the totality of effort devoted to exploitation and exploration activities. The present study proposes a positive correlation in the Chinese cellphone market between a cellphone manufacturer's sales growth rate and 1a)BD, 1b)CD, and the simultaneous pursuit of 1c)BD & CD. The study also proposes that East Asian firms would exhibit a higher level of organizational ambidexterity in both 2a)BD and 2b)CD based on my discussion of cultural and institutional factors. The analytical results indicated that East Asian cellphone firms indeed demonstrated a higher level of organizational ambidexterity across both dimensions compared to their Non-East Asian counterparts. Mixed findings were obtained concerning organizational ambidexterity's impact on organizational performance. The results partially supported that BD ambidexterity has a positive correlation with organizational performance. Contrary to expectations, the findings revealed a negative effect of CD ambidexterity on organizational performance. In addition, no significant relationship was detected between the simultaneous pursuit of BD & CD ambidexterity and organizational performance. Overall, the results support Raisch & Birkinshaw's (2008) findings that the relationship between organizational ambidexterity and organizational performance is complex. The present study contributes to the

literature by providing empirical evidence to the presence of a complex relationship between organizational ambidexterity and performance using the BD & CD framework. Discussion of the findings also offers insights into business practices in the consumer electronics industry.

*Keywords:* organizational ambidexterity, exploration, exploitation, innovation, cellphone, mobile phone, Chinese market, East Asian

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# **Ambidexterity in the Cellphone Industry:**

## **An Empirical Study of Asian Firms**

### **INTRODUCTION**

“A juggler who is very good at manipulating a single ball is not interesting. It is only when the juggler can handle multiple balls at one time that his or her skill is respected.” —Tushman & O’Reilly (1996, p. 11).

Devices known as cellphones, mobile phones, handsets, hand phones, and many other names, are effectively the same product. Since it became commercially available roughly two and half decades ago, cellphone has enjoyed a staggering rate of proliferation, and significantly changed the world by facilitating convenient communication (Goggin, 2012). As reported by the statistics from the International Telecommunication Union (ITU), the world’s total mobile cellular subscription per 100 people has jumped from 15.5 in 2001 to 98.5 in 2015, and the number continues to grow (ITU/ICT, 2015). According to IBISWorld, the largest provider of industry information in the U.S., the global cellphone industry will continue to exhibit strong growth throughout 2021 (IBISWorld Industry Report, 2016a).

However, despite the prosperity of the cellphone market, a large number of cellphone companies had experienced drastic fluctuations. Nokia, for example, had a global market share of 40% in the first quarter of 2008, but in the third quarter of 2015 the company only held a market share of 6.2% being the company that suffered the greatest market share decrease; a similar case is Motorola, a cellphone company that used to own a double-digit market share in the global market in the first quarter of 2008 but stopped its own cellphone business in 2011 (Statista, 2015). While the previous market leaders were losing their crowns, new market players from the East Asia have been rising sharp and strong. As reported by the Forbes (Shepard, 2016), a Chinese brand named Huawei has been growing up to be the world’s leading smartphone brand in world shipment – together with companies such as Xiaomi, TCL, and OPPO. The previously little-known brands

have stolen the spotlight from the former leaders (Lee, 2016). Similar situations were not just happening to underdogs like Motorola and Nokia, but also happening to the biggest and leading companies such as Apple, and happening in the world market, too. IBISWorld (2016b) forecasts Apple's global shipment in 2016 to decline by 3.0%, respectively from 2015, while Chinese brands Huawei, OPPO, and Vivo's shipment to surge by 29.0%, 54.0%, and 48.0%, respectively, during the same period.

This phenomenon as a result of hyper-competition is particularly interesting. Thus, this paper seeks to explore the following questions: How do East Asian companies (e.g., Samsung, Huawei, OPPO) in the cellphone industry outshine the previous big players from the Non-East Asian regions (e.g., Apple, Nokia, Blackberry)? What does a firm need to do to improve its performance in the consumer electronics industry drawing from the result from the first question?

Many researchers have used organizational ambidexterity theory to explain organizational performance from a management perspective (e.g., Cao, Gedajlovic, & Zhang, 2009; Hargadon & Bechky, 2006; He & Wong, 2004; March, 1991). Organizational ambidexterity is a relatively new paradigm deriving from organizational learning theory, which addresses the interplay between organizational exploration and exploitation (Raisch & Birkinshaw, 2008). The organizational ambidexterity theory is particularly applicable to analysis in technology concentrated industries, because these industries are featured by high-speed technological exploration and exploitation (He & Wong, 2004; Fernhaber & Patel, 2012). Additionally, the cellphone industry as a subdivision of the consumer electronics, shares similar features of the subjects under the scope of past organizational ambidexterity research (Fernhaber & Patel, 2012). As a result, I address the questions aforementioned mainly based on the organizational ambidexterity theory.

Since the literature on organizational ambidexterity emerged two decades ago, there is an inadequacy of both empirical and conceptual research that examines organizational ambidexterity and its relationship with organizational performance. To begin with, ever since organizational ambidexterity became a stream in the literature, researchers have been debating on the conceptualization of organizational ambidexterity. These researchers can be divided into two groups based on their arguments. One school of scholars argue that organizational exploitation and

exploration are the two extremes of one continuous paradigm, and the two organizational activities would essentially conflict each other with regard to resource demands and managerial practices; therefore, this school of scholars define ambidexterity as the ability to align the trade-offs between exploitation and exploration to achieve an equilibrium (e.g., Tushman & O'Reilly; Raisch & Birkinshaw, 2008; Wang & Rafiq, 2014). The second school of scholars argue that organizational exploration and exploitation are two different spectrums which can be complementary under certain conditions (e.g., Gupta, Smith, & Shalley, 2006). This school of scholars conceptualize organizational ambidexterity as a firm's ability to maximize the effort in both organizational exploration and exploitation simultaneously. Cao et al (2009) refer to these two ways of conceptualization as the Balance Dimension (BD) and Combined Dimension (CD). Scholars find it hard to generalize findings from organizational ambidexterity studies because of the existence of such difference, and call for more clarification on the conceptualization of organizational ambidexterity (Raisch & Birkinshaw, 2008).

Putting the conceptualization issue aside, a second gap in the organizational ambidexterity literature is the inconsistency of findings across different studies on the relationship between organizational ambidexterity and organizational performance. Although the majority of the small population of organizational ambidexterity studies found that organizational ambidexterity directly and positively impacts organizational performance (Simsek, 2009), some scholars found the relationship between organizational ambidexterity and organizational performance to be contingent (e.g., Lin, Yang, & Demirkan, 2007), few scholars found the relationship to be negative (e.g., Atuahene-Gima, 2005), while some other scholars found the correlation to be curvilinear (e.g., Yang & Atuahene-Gima, 2007; Zhang & Zhao, 2015). This inconsistency hinders the application of the findings into the real business settings, and thus more empirical studies are needed.

Aware of the research gaps mentioned above, I aim to answer the research questions by adopting both conceptualizations of organizational ambidexterity. I lay the research setting in China, because it is the most notable example of the booming cellphone market. While the annual revenue growth rate of the global cellphone industry is between 2% to 3% from 2016 to 2021, the Chinese cellphone industry's annual revenue growth rate is around 9% during the same period

(IBISWorld Industry Report, 2016a, 2016b), making it one of the most highlighted markets of the industry. Meanwhile, home to a number of new market leaders in the arena, the Chinese cellphone market also offers a glimpse into the hyper-competition of the industry.

Additionally, an investigation of the Chinese cellphone industry has the potential to offer valuable insights and conclusions that can be applied to future business activities in similar industries, and countries of similar markets as well. To reiterate, the Chinese cellphone market is expected to grow at a fast pace throughout the years from 2017 to 2021 (IBISWorld Industry Report, 2016a); underdeveloped cellphone markets compared to China, such as India, Thailand, Mexico, and Brazil, seem to follow the path of the Chinese cellphone market with regard to the key market statistics and trends<sup>1</sup>. These characteristics suggest that it is not unsafe to generalize the findings of the present study in the Chinese cellphone market, to business endeavors in the future and elsewhere. In this manner, the current study possesses practical implications.

In the following parts of this paper, the first section is a review of the organizational ambidexterity literature, including the definition of organizational ambidexterity and its relationship with organizational performance. The subsequent theoretical development and hypothesis section provides my argument from multiple perspectives that East Asian firms are better at managing organizational ambidexterity. After that, I will detail the empirical methods, results, and findings. From there, I will wrap up the paper with a discussion on implications,

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<sup>1</sup> Category Briefing on *Mobile Phones in India*, Euromonitor International, September 2016. Retrieved from <http://www.portal.euromonitor.com/portal/analysis/tab>.

Category Briefing on *Mobile Phones in Thailand*, Euromonitor International, December 2016. Retrieved from <http://www.portal.euromonitor.com/portal/analysis/tab>.

Category Briefing on *Mobile Phones in Mexico*, Euromonitor International, October 2016. Retrieved from <http://www.portal.euromonitor.com/portal/analysis/tab>.

Category Briefing on *Mobile Phones in Brazil*, Euromonitor International, September 2016. Retrieved from <http://www.portal.euromonitor.com/portal/analysis/tab>.

contribution, and limitation of the current research, as well as insights for future studies. Conclusions come at the end.

## **LITERATURE REVIEW**

### **Conceptualization of Organizational Ambidexterity**

The term “organizational ambidexterity” first appeared in Duncan’s (1967) article on designing a firm structure that could achieve simultaneous pursuit of exploitative and explorative innovations. However, there has not been a proliferation of academic interest and studies on the notion of organizational ambidexterity until March’s (1991) landmark article on organizational learning in terms of exploration, exploitation, and competitive advantage. As is pointed out by Simsek et al’s (2009) review article, the research stream has exclusively used March’s (1991) notions of exploitation and exploration.

Reviewing March’s (1991) typology, exploitation refers to the refinement and repetition of existing routines, while exploration refers to the practices that involve “search, variation, experimentation, and discovery.” He proposes that while the two kinds of practices are both critical to a firm’s long term competitive advantage, they are two substantially different learning activities. As a result, exploitation and exploration might likely require essentially different organizational structures, strategies, and contexts. Thus, in March’s typology, exploitation and exploration’s demands on an organization are inherently conflicting in terms of resource demands and managerial practices. In line with this view, ambidexterity is precisely the concept to align the inevitable and tensional trade-offs between exploitation and exploration to achieve an optimized balance between these two notions.

In accordance with this way of characterization, there is a stream of research on organizational ambidexterity arguing that ambidexterity is related to the simultaneous pursuit of, or balancing between exploitation and exploration. For example, Tushman and O’Reilly (1996) maintain that an ambidextrous organization would be an entity able to implement both incremental (i.e., exploitative) and revolutionary (i.e., explorative) changes. Gibson and Birkinshaw (2004) suggest that “contextual ambidexterity is the behavioral capacity to simultaneously demonstrate alignment (through exploitation) and adaptability (through exploration) across an entire business unit” (p. 209). Lubatkin, Simsek, Ling, and Veiga (2006) define that “ambidextrous firms are

capable of exploiting existing competencies as well as exploring new opportunities with equal dexterity” (p. 647).

In more recent literature, however, some studies have gone beyond the most widely noted argument that organizational ambidexterity is related to the balanced pursuit of exploitation and exploration, and proceed to resolve the question on whether or to what extent organizational ambidexterity involves an organization’s effort to boost both exploitation and exploration together, apart from the attempt to attain an optimized equilibrium. These studies suggest an alternative dimension of ambidexterity as the combined magnitude of exploitative and explorative activities which signify the attempt to maximize both simultaneously (e.g., Cao, Gedajlovic, & Zhang, 2009). In an empirical study on the effect of organizational ambidexterity on organizational performance in the technological innovation context, He and Wong (2004) pioneered the organizational ambidexterity study in the above stream by arguing that there can be two different interpretations of ambidexterity in the literature, with the former focusing on the relative magnitude of exploitation and exploration, and the latter focusing on the absolute magnitude of the two. However, He and Wong (2004) primarily focused on the operationalization of the relative dimension of organizational ambidexterity without shedding too much light on the conceptual building of organizational ambidexterity. To facilitate a format of terminologies, I would refer to the relative magnitude of organizational ambidexterity as Balance Dimension (BD), and the absolute magnitude of organizational ambidexterity as Combined Dimension (CD), in line with Cao et al. (2009), throughout this paper.

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Insert Table 1 about here

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To disentangle the ambiguity in the BD and CD facet of the definition of organizational ambidexterity, Cao et al. (2009) illustrated the differences of the two using an example of two fictional firms as displayed in Table 1 which presented the magnitude of exploitative and

explorative activities. Firm A holds a score of 10 on exploration and 5 on exploitation, while Firm B has a score of 5 on both exploration and exploitation. Depending on the way of conceptualizing organizational ambidexterity, Firm A and Firm B would have different levels of ambidexterity. If we conceptualize organizational ambidexterity as balancing exploitation and exploration, Firm B would be more ambidextrous than Firm A because Firm B's effort is more evenly distributed between exploitative and explorative activities; meanwhile, if we conceptualize organizational ambidexterity as the combined magnitude of exploitation and exploration, then we would have an entirely opposite conclusion where Firm A would be more ambidextrous than Firm B, as Firm A holds a total score of  $5 + 10 = 15$ , higher than that of Firm B which is  $5 + 5 = 10$ .

Cao et al. (2009) argued that this would result in the vastly different operationalization of the organizational construct. Conforming to the BD view, we can operationalize organizational ambidexterity as the absolute difference between exploitation and exploration (He and Wong, 2004), thus Firm B would be seen as more ambidextrous; whereas we can operationalize organizational ambidexterity as the product (Gibson and Birkinshaw, 2004; He and Wong, 2004) or sum (Lubatkin et al., 2006) of exploitation and exploration, if we adopt a CD view, where Firm A would be seen as the more ambidextrous firm. Without properly addressing the inconsistency of research in ways of conceptualizing ambidexterity with regard to BD and CD dimension, it would be hard for scholars to compare results across studies and to create a synergy accordingly hoping to apply the results to actual business situations on whether firms should pursue a balanced effort between exploitation and exploration, or should they aim to optimize the combined effort between the two activities (Cao et al., 2009).

Recognizing the two different ways to conceptualize organizational ambidexterity in the previous studies, the current study takes in both BD and CD view of ambidexterity so that it would not only grasp the topic in a more holistic way and donate empirical support to both streams of arguments, but also contribute to the clarification to the ambidexterity construct.

### **Balance Dimension of Organizational ambidexterity (BD)**

Researchers on organizational ambidexterity argue that a higher level of BD, i.e. a balanced pursuit of exploitation and exploration, would contribute to an organization's performance and



long term survival through more structured control of performance risk (e.g., Tushman & O'Reilly, 1996; He & Wong, 2004; Cao et al., 2009; Papachroni, Heracleous, & Paroutis, 2015), whereas an imbalanced pursuit of exploitation and exploration might jeopardize the organization's performance through an increase in such risks (Levinthal & March, 1993; Powell, Koput, & Smith-Doerr, 1996; Benner & Tushman, 2003).

This argument is two-fold. On the one hand, if a firm invests most of its efforts into exploitative activities but proportionally little or no resources into explorative activities, the firm might risk being obsolete (Cao et al., 2009; Holmqvist, 2004; Leonard-Barton, 1992). Although exploitative activities might bring short-term success to a firm by exploiting existing products and markets, a lack of explorative activities would expose the firm to the risk of not being able to adapt to significant market and technological changes (Powell et al., 1996), let alone that the excessive "self-reinforcing behavior (of exploitative knowledge absorbing) might lead to the neglect of new technological developments" (Cohen & Levinthal, 1990, p. 138). Similarly, Hannan and Freeman (1984) proposed that a firm's unbalanced effort to adapt to existing environment demands might result in structural inertia which would in return reduce the firm's ability to adapt to future environmental changes and grasp new opportunities. Both arguments have received support from empirical studies (e.g. Atuahene-Gima, 2005; Yalcinkaya, Calantone, & Griffith, 2007; Andriopoulos & Lewis, 2009).

On the other hand, in a reversed situation where a firm invests most of its efforts into explorative activities but proportionally little or no resources into exploitative activities, there will be a high chance of not being able to leverage the efforts devoted into search and experimentation activities (Cao et al, 2009), and a high risk of failing to adapt to the existing environmental demands (Hannan and Freeman, 1984). Recalling March (1991), it is argued that organizations skewed extremely towards exploration to the exclusive of exploitation might "exhibit too many underdeveloped new ideas and too little distinctive competence" (p. 71). Levinthal and March (1993) also argued that too much reliance on exploration with the absence of complementary levels of exploitation is likely to lead to "failure trap" where an organization's resources would be constantly drained with no immediate financial reward in the foreseeable future. Many cases for supporting this argument can be drawn from Teece (1986), where the researcher looked into

examples where the firm which is the first to introduce a certain innovation into the market failed to maintain the lead by exploiting this innovation. Those examples include but are not limited to RC Cola with canned cola and diet cola, EMI with scanner, Bowmar with pocket calculator, Xerox with office computer, and De Havilland with Comet passenger plane. A more recent example which is closely related to the topic of the current study is the touch screen smart phone technology. Over two decades after the Simon Personal Communicator created by IBM made its first appearance in the market, not a lot of people know it is the first touchscreen phone ever made, and maybe even fewer people know IBM once had a cellphone business, because it lasted only six months after being put on the market in the summer of 1994 (Sager, 2012).

### Combined Dimension of Organizational ambidexterity (CD)

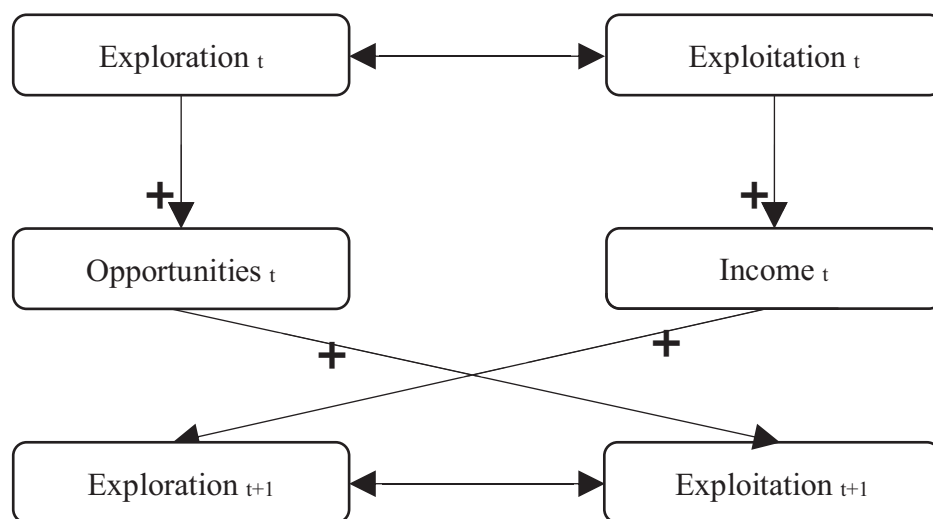


Figure 1. The Paradoxical Association between Exploration and Exploitation. Reprinted from “Exploration and Exploitation Within and Across Organizations,” by D. Lavie, U. Stettner, and M.L. Tushman, 2010, *The Academy of Management Annals*, 4, p. 117. Copyright 2010 by the Academy of Management Annals.

Contrasting to the BD point of view that exploitation and exploration are on the two far ends of one single spectrum, the core of CD ambidexterity is that exploitative and explorative activities are totally different processes that can function side by side. Under certain circumstances, these two kinds of activities can take place in complementary domains (e.g., technologies and markets) that do not invoke competition for resources (Gupta, Smith, & Shalley, 2006). Some scholars argue that although exploitation and exploration might often be at tension, exploration would generate opportunities so that later exploitation by the organization is possible; conversely, exploitation would generate the income needed for further exploration (Lavie, Stettner, & Tushman, 2010). In this way, the relationship between exploitation and exploration is a trade-off in real time, while indirect mutual reinforcing over time, as is illustrated in Figure 1 (Lavie et al, 2010). Meanwhile, some other scholars examined the exploitation – exploration relationship from the organizational learning perspective, arguing that through repeated use of established knowledge and resources (exploitation), the management can develop a better awareness of where they reside within the organization, and have a more comprehensive understanding of the functionality of existing knowledge and resources; as a result, the organization would be able to improve its ability in reconfiguring the knowledge and resources already under its control, and turn them into competitive advantages (Fleming, 2001; Hargadon & Sutton, 1997; Kogut & Zander, 1992). For example, Schilling and Phelps (2007) tested this argument with a longitudinal study of the patent performance of 1,106 firms from 11 industry-level alliance network and find support for the proposition that firms embed in alliance network that exhibits both high clustering and high teach (i.e. short average path length to a wide range of firms) can have greater innovative output over firms in networks that do not hold a combination of these characteristics. In a study conducted by Hargadon and Bechky (2006) using intensive case studies within six professional consulting organizations suggests that while some creative solutions can be seen as the product of individual insight, others should be seen as the products of a momentary process, which reflects a qualitative change in the underlying essence of the creative process, “as the comprehension of a problematic situation and the generation of creative solutions draw from – and reframe – the past experiences of participants in ways that lead to new and valuable insights (p. 484)”.

## **THEORETICAL DEVELOPMENT AND HYPOTHESES**

This section starts with a brief introduction to the Chinese cellphone industry as it highly pertains to the present study. Then the section will continue to provide reasoning for the relationship between organizational ambidexterity in both BD & CD dimension and a company's performance in the market. Various factors, including cultural and institutional factors, that might influence a company's level of organizational ambidexterity are discussed. After each segment of arguments, the hypotheses would follow.

### **The Chinese cellphone industry**

IBISWorld (IBISWorld Industry Report, 2016b) defines the cellphone industry in China to include all firms that manufacture mobile communication terminal equipment, including mobile phones, cellular base station, phone accessories and other mobile communication equipment including hands-free mobile kits, two-way radios, and pagers. The industry is featured by a high rate of technology development, where sales driven by dated technology continues to decline. The technology changes in the industry are rapid and regular, with high R&D rates.

The IBISWorld report, which is the main source of this section, shows an average annual revenue rate of 10.2% during the five-year era from 2011 to 2016 in the domestic market, while the exports are estimated to account for over 60% of industry revenue in 2016 as Chinese domestic manufacturers continue to extend their efforts in bringing their brands international.

The past five years have seen substantial changes to the Chinese cellphone industry. Although the industry started to see high production rates since the Chinese government its control over the production of mobile phones in 2003, it is during the past five years that the country has become the largest manufacturer of mobile phone equipment in the world. Equipped with new technological changes with regard to 3G and 4G or even 5G's fast connection, internet access, digital photography, graphics transmission and display, the country is now producing more than half of the global shipment.

The IBISWorld report points out that China's large population and expansion of wireless 2G, 3G, and 4G network coverage were important stimulators of the domestic demand growth. It is optimistic for the market growth outlooks.

The market structure, however, seems to be going through major shifting. As the mobile phone penetration rate reached a high rate, more purchase will be replacement/upgrade oriented where consumers of middle and high incomes would go for better models that feature various functions that enhance the usability, although they might already have a cellphone. At the same time, there remains a gap between rural and developed areas. The rural areas seem to hold huge potential for growth in the long run. As these different segments of consumers are very likely to differ in their demand for phone products, this shift in the market might impact how cellphone companies would pursue explorative and exploitative activities.

Albeit the first company operating in the Chinese cellphone market can be dated back to the early 1990s, the past couple of years have seen a considerable number of new entrants. In September 2016, there are approximately 480 enterprises operating within the Chinese cellphone industry. The past few years have seen an increasingly heated competition among numerous mobile phone companies.

As stated in the introduction of this paper, Chinese cellphone manufacturers have managed to grab a bigger share of both the domestic and the world market. Manufacturers such as Huawei, OPPO, and Vivo have exhibited a faster developing speed than long established leading manufacturers such as Samsung and Apple. Just as Apple's global shipment in 2016 is predicted to decline by 3.0%, respectively from 2015, Chinese brands like Huawei, OPPO, and Vivo's shipment is projected to rocket by 29.0%, 54.0%, and 48.0%, during the same time from 2015 to 2016.

To sum up, the Chinese cellphone market is characterized by rapid growth, intense competition, and an oscillation of the structure of demand. All of these features might have influence on how a manufacturer would pursue its strategy in organizational ambidexterity.

### ***Choice of Research Variables***

In order to facilitate a meaningful discussion on the relationship between organizational ambidexterity and organizational performance, it is essential to specify the choice of research variables utilized in the present study. I choose to measure the firm performance of cellphone companies by sales growth rate based on the theoretical reason that it is a measurement that is highly organization-growth orientated (Lumpkin & Dess, 1996), and thus it is an appropriate measurement for the research interest of the present study.

As aforementioned, the sales in the Chinese cellphone industry is driven by rapid development of technology which is reflected in the phone models as a product, the present study deemed it appropriate to measure organizational ambidexterity by focusing on phone models of the manufacturers.

### **Organizational Ambidexterity and Organizational Performance**

As highlighted previously, a number of researchers have conducted empirical studies on the relationship between organizational ambidexterity and organizational performance in both BD and CD dimension (Gupta, Smith, & Shalley, 2006; Gupta, Smith, & Shalley, 2006 Papachroni, Heracleous, & Paroutis, 2015). Nonetheless, there has not been a focus on the Chinese cellphone industry in the literature, despite several unique features make it stand out. First, the Chinese cellphone market displays a high level of competition intensity, which might influence the innovation strategy of a company (Porter, 2000, p. 253); second, the structure of Chinese cellphone market is currently in a swift and violent vibrate, where there is an increasing demand for both products featured by basic functionalities and low price, and products featured by prime usability, high-end design, but high prices. This shift in the market structure makes the Chinese cellphone industry an uncommon context in terms of the dynamics between exploration and exploitation, and it might be hard to apply findings from prior research to this industry. Therefore, it is necessary to verify findings from the previous literature concerning the relationship between organizational ambidexterity and organizational performance, in the context of Chinese cellphone industry specifically.

Recalling what we illustrated in the literature review section of the current research, scholars have proposed a positive relationship between organizational ambidexterity and organizational performance for several reasons. First, a high level of BD ambidexterity contributes to firm performance through more structured control of performance risk (Levinthal & March, 1993; March 1991). To be specific, when a firm is disproportionately dedicated to exploration rather than exploitation, it would be more likely to risk failures to attain returns from its costly search and experimentation activities (Cao et al., 2009). The failure of IBM to promote the world's first touch screen mobile phone is a touché example to illustrate such a situation. If IBM had continued to invest in exploit the touch screen technology by constantly refining it, one could almost be certain that the sales of phones equipped with latest touch screen technology would be higher. On the other hand, in such a highly technology oriented industry as the cellphone market, high-end consumers would “vote” for new innovations by purchasing products that they perceive as hi-tech; this consumer's tendency is further amplified by the market trend of a growing proportion of middle and high-income Chinese consumers (IBISWorld Industry Report, 2016b; Van der Heijden, Verhagen, & Creemers, 2003). Therefore, a careful trade-off between exploitation and exploration is a must for cellphone manufacturers to donate a high level of performance. For the CD organizational ambidexterity, apart from the argument mentioned in the literature review section that exploration and exploitation can be complementary and mutually enhancing, scholars also argue that a high CD is a firm specific advantage that can be transferred into competitive advantages and not something that can be easily copied (Raisch & Birkinshaw, 2008). Arguments in both dimensions of organizational ambidexterity have received empirical support (e.g., Teece, 1986; Sager, 2012; Schilling & Phelps, 2007; Hargadon & Bechky, 2006). I thus hypothesize that we can observe similar results in our study:

*For firms in the Chinese cellphone markets,*

***Hypothesis 1a:*** *The level of organizational ambidexterity in Balanced Dimension has a positive relationship with organizational performance.*

***Hypothesis 1b:*** *The level of organizational ambidexterity in Combined Dimension has a positive relationship with organization performance.*

In the current study, I also argue that the simultaneous pursuit of BD and CD helps cellphone firms to yield better performance. In other words, I expect a high level of BD ambidexterity to enhance the positive relationship between CD ambidexterity and firm performance. This argument is an extension of the previous two hypotheses. It has been argued above that a company with high level of CD would be able to access a bigger range of knowledge and resources. These knowledge and resources are essentially the product of organizational exploration and exploitation. Cao et al (2009) argues that if the firm performs significantly worse in its exploitation efforts than in its exploration efforts, it often suggests that the firm has a poor absorptive capacity. Absorptive capacity, according to Zahra and George (2002), has four dimensions: the ability to acquire, assimilate, transform, and exploit knowledge to generate organizational capabilities. When the transformation capacity is weak, by definition the company will find it difficult to combine and assimilate the knowledge and resources it has newly acquired. Au contraire, when the company is heavily shifted towards exploitation over exploration, the company will receive less new knowledge and resources on which exploitation behavior can be based. These two situations are two aspects of an unbalanced BD, and in both of these situations, the mutual enhancement between exploration and exploitation is impeded. Comparatively, in the ideal situation where the company displays both a high level of BD and a high level of CD, we can expect the company has a larger amount of knowledge and resources, and a good appetite to feed on these knowledge and resources, turning them into better firm performance. A practical interpretation of the reasoning mentioned above is, if a cellphone company provides a vast plethora of phone models that cover a wide range of level of innovativeness, its products should sell well, because it not only offers more choices for all segments of consumers to choose from, but it also controls for risks that certain models might fail in utilizing certain technologies – and if these models do fail, the technologies they use can be improved and applied to future products.

*For firms in the Chinese cellphone markets,*

***Hypothesis 1c:*** *A high level of both Balance Dimension and Combined Dimension of organizational ambidexterity simultaneously has a positive relation with organizational performance.*



## **EA Firms versus Non-EA Firms**

Viewing firm's behaviors from an angle of East and/or Western management practices can sometimes lead to over generalizations because East and West are only regional concepts rather than distinct ideologies (Gupta, 2011), where there are numerous types of management practices different from region to region. However, an extended view of East/West, and in this case, East Asian (EA) / Non-East Asian (NEA), would enable researchers to put organizations under study into contexts that would help them understand certain management practices of a given organization (Imani, 2012). Plus, the "East" firms in this study are all from the East Asian region, where the majority of people are under the shared cognitive influence of Confucianism, Buddhism, and sometimes Taoism (Bond, 1991; Pan, Rowney, & Peterson, 2012). Therefore, firms in each class in this study, East Asian and Western, would hold a considerable level of homogeneity, and as a result, we are able to discuss the heterogeneity between these two classes of firms meaningfully. In the section below, the different levels of organizational ambidexterity between East Asian and Non-East Asian companies will be discussed based on the arguments of cultural and institutional factors.

Following Chen and Miller (2010), it can be argued that Asian firms' tendencies in management practices are more ambidextrous than those firms from the West in pursuing vastly different, resource competing, or even tensional strategies. Based on Chen and Miller's (2010) argument, the reason of this is that the culture in which East Asian firms are embedded is comparatively more ambidextrous than that Non-East Asian firms inlay.

Hoecklin (1995; as cited in Chen & Miller, 2010) argued that, the characteristics of a certain business culture are consistent with traditional culture in the focal region. While in the Western ways of thinking, much of the opposites are viewed in an "either/or" framework (Lewis, 2000; as cited in Chen & Miller, 2010), East Asian culture is under the influence of Confucianism that advocates "balanced harmony", the standpoint where diverse theories and practices should peacefully co-exist and complement each other (Yum, 1988; Chen & Miller, 2010). Apart from Confucianism, Taoism, the Yin and Yang School, Buddhism, and other schools of philosophy also have an unneglectable impact on the contemporary thinking in the focal culture zone (Su, Zhang, & Hulpke, 1998). To give an example from all of those just mentioned, the core value of School

of Yin and Yang emphasizes the gravity of bringing contradicting entities and ideas into harmony (Barkema, Chen, George, Luo, & Tsui, 2015). A review of the cross-national and cross-cultural organizational behavior literature (Tsui, Nifadkar, & Ou, 2007) shows that culture at the national level does have both direct and indirect impact on the individual and team outcomes in an organization.

Institutional factors also play a vital role in shaping business culture and practices (Barkema et al., 2015). As a matter of fact, Chinese cellphone manufacturers are not shy of reverse engineering, and they are considerably effective in doing so (Dong & Flowers, 2016). This was a result of both historical and cultural factors. Due to China's widespread poverty and communist philosophies in the past, individuals and organizations are often indifferent to the idea of intellectual property protection (Keupp, Beckenbauer, & Gassmann, 2009); the East Asian approach to education also contributes to the reverse engineering phenomena: students are generally encouraged to memorize and copy the works of experts or masters before the students are considered "good enough" to work on their own (Harvey, 2011). As a consequence, the world has seen a large scale of Chinese knock-outs in various industries and markets from 2003 to 2009 (Schotter & Teagarden, 2014). Regardless of the negative view on reverse engineering, Chinese manufacturers sharpened their skills in imitating product design with technological innovations, reducing cost, and reduce the lead time necessary to manufacture and deliver products to the market (Dong & Flowers, 2016). The Chinese manufacturers' gradual improvement of innovations well matches the definition of exploitation in the current study.

On the other hand, institutional changes in the recent decade have forced and/or encouraged Chinese cellphone manufacturers to boost their investment in their independent intellectual property. Under huge pressure from the international community, the Chinese government has been intensifying its effort in enforcing intellectual property protection laws, discouraging the Chinese manufacturers from being copycats (Perkowski, 2012); and since Chinese manufacturers together with manufacturers from other East Asian countries are seeking to enlarge their market in the global arena (Euromonitor, 2017), it is necessary for these companies to establish their own patents for both legal and reputation reasons. To date, the patents filed by Chinese companies each year have rocketed (Euromonitor, 2017), while Chinese cellphone products like Huawei P10 and Vivo X9 kept amazing the global consumers with leading technology and features (Sin, 2017;

Kang, 2016). This provides support that the Chinese manufacturers are competent at organizational exploration.

In addition, it is argued that the East Asia has been in constant contact with the West in different levels (Zhao & Zhou, 2004), which has resulted in a conduct of adopting “best” practices in the culture. After WWII, there was a trend in East Asia for organizations to take on modern management practices, which, historically, has originated from the West (Pun, Chin, & Lau, 2000). Firms would thus learn western practices while retaining their eastern characteristics. To give an example, a detailed content analysis of 259 articles that used Chinese sample published in the top six management journals, including the AMJ (Jia, You, & Du, 2012), found there were only three new concepts. The notion in these arguments is in line with some other researchers’ propositions and results of empirical studies. Ghoshal and Bartlett (1994) proposed that contextual ambidexterity, defined above as “behavioral capacity to simultaneously demonstrate alignment (through exploitation) and adaptability (through exploration) across an entire business unit” (Gibson & Birkinshaw, 2004), is grounded within the type of organizational culture, while results from Gibson and Birkinshaw’s (2004) empirical study on 41 business units from ten multinational firms supported this same proposition; Using an over 2000 subject sample of medium-sized firms from ten European countries, Von Everdingen and Waarts (2003) were able to establish a relationship between the effect of national culture based on Hofstede’s Culture Framework (2001) and Hall’s cultural classification (1976), and companies’ capabilities to have radical and incremental innovations; Rodriguez, Regina, and Hechanova (2014) used the same Culture Framework analyzing on work unit level and also found a significant relationship between culture dimensions and organizational ambidexterity. Tellis, Prabhu, and Chandy (2009) tested the link between radical innovations of companies with government policy and labor, capital, and culture at the national level, and were able to obtain significant evidence of support, drawing from results of an analysis on 759 firms across 17 major economies of the world. A study conducted by Wang and Rafiq (2014) was especially worthy of mentioning, as the two scholars hypothesized that contextual ambidexterity mediates the relationship between ambidextrous organizational culture and new product innovation outcomes. Using structural equation modelling on over 1300 companies from the UK and 1900 companies from China, across multiple industries, the two scholars were able to find significant relationships between ambidextrous organizational culture

contextual ambidexterity, and new product innovation outcomes. In concordance with the previous research, I expect my study to find a high level of ambidexterity in the East Asian cellphone firms.

*In the Chinese market, compared to Western cellphone firms,*

***Hypothesis 2a:*** *Asian cellphone firms have a higher level of Balance Dimension of organizational ambidexterity.*

***Hypothesis 2b:*** *Asian cellphone firms have a higher level of Combined Dimension of organizational ambidexterity.*

## **METHODS**

To investigate the relationship between a cellphone manufacturer's organizational ambidexterity and its firm performance, and to examine whether East Asian cellphone manufacturers generally display stronger organizational ambidexterity than their Non-East Asian counterparts, I designed a hybrid research approach of quantitative and qualitative methods. In this section, the research empirical setting, sample and data collection, and statistical tools used in the analysis, are detailed.

### **Empirical Setting and Samples**

The present study focuses on the Chinese cellphone market, which is part of the consumer electronics industry, as the context of research. The observation window is from 2007 to 2016, across ten years. It should be reiterated that, while the market size for cellphone has been growing constantly at a rapid pace during the past decade, the competitive landscape has not only intensified as a considerable number of new manufacturers has joined, but also undergone structural change as well. These features of the Chinese cellphone market shall provide ample companies, and sufficient variance in the factors on which this research aims to study.

Subjects under the scope of the current study are the leading 25 cellphone manufacturers from the industry (See Table 2 List of Cellphone Manufacturers under Study). These companies occupied approximately 90% of the market share in early 2014, and covers both foreign and domestic brands, of various sizes and ages.

It is worth noting that several mergers and acquisitions happened during the 10-year observation window. Different approaches were taken to address this problem. As in the case of Motorola being acquired first by Google in 2011 then by Lenovo in 2014, because Motorola largely remained an independent subsidiary company, it was listed in parallel together with other manufacturers; in the case concerning Sony bought out Ericsson in the Sony-Ericsson Mobile Communication AB in 2012, the company prior and after the buyout were seen as one single company, and is labeled as Sony indistinguishably in the present study.

As a result, an unbalanced panel data set was collected on the 25 selected companies from 2007 to 2016, where 161 observations were obtained.

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Insert Table 2 about here

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## **Data collection**

An array of different sources was utilized to gather data necessary for the analysis. These sources can be categorized into four main different kinds: a business report from Euromonitor, textual data from Factiva, company annual reports, and information on cellphone models from special interest websites for cellphone products. The combined data set covers all the 25 companies under the scope of the present study, over the study's observation window from 2007 to 2016.

### ***Business Report.***

A report, *Mobile Phones in China, September 2016*, was purchased from Euromonitor<sup>2</sup>. Trusted by both scholars in academia and business personals (e.g., Ryals & Payne, 2001; Deng, 2007; Cheah, Teo, Sim, Oon, & Tan, 2011), Euromonitor is a world leading company in strategy research for consumer markets for almost five decades, and has extensive network of strategic analysts in over 80 countries including China. Marketing data including the sales volume and company share were abstracted from the report. These data cover the leading companies, including the 25 companies under the present study, in the Chinese cellphone market from 2007 to 2016 over

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<sup>2</sup> The expenses involved in purchasing this particular report was sponsored by the CASA-Concordia Aid to Scholarly Research Fund. This grant is issued with the objective to help Master of Science students and faculty supervisor to achieve thesis research goals.

a span of a 10-year period. The purchased report also does offer an outlook for the market in the near future, a brief overview of the industry, and key trends in the industry as a whole.

### ***Textual Data.***

I used Factiva to collect textual data. Factiva is a business intelligence tool that allows scholars to gather information from global news, business information and analysis from traditional publications like newspapers and magazines, newswires, trade publications, multimedia and media sources including websites, blogs, boards and curated social media, and was widely used in content analysis (Uotila et al., 2009). From the Factiva database, I collected all published news articles concerning a certain subject manufacturer in a given year, which are essentially textual data. Specific efforts were made to make sure the articles are focused on the cellphone business of subject company during the search on Factiva, and after the articles were collected.

During the search, I used Factiva's "Query Genius" function to find articles that contain the subject company's company name, company name abbreviation, or brand name; if the company name or brand name are spelled differently in Chinese Pinyin, the Pinyin equivalents were also included in the search query; I also took advantage of Factiva's "intelligent indexing" function to rule out articles that contain the name or abbreviation of the company, but are effectively irrelevant with the company. After I have collected the articles, I developed computer language using Python2.7 to delete articles that contain too much information about companies other than the subject company, so that the textual data concerning the subject company was not contaminated by information of other companies. This decontamination process is important, because the article might not be about the focal company. This can be illustrated by a typical example from the search result for Samsung (see the sample article in Appendix 1), where all company and brand names are highlighted in bold font.

Despite this article is from the search result for Samsung, one can clearly see that the main body was not about Samsung, but Apple and its cellphone brand iPhone. As a result, this article was deleted from [Samsung\_2016] article pool, but kept in [Apple\_2016] article pool. This process was applied to almost all research results, except in some rare cases where the screening will leave no articles in the pool and the condition will have to be loosened. Approximately 2.3 GB of

over 288,000 articles in .RTF format remains after this process, covering all the 25 companies during the 10-year observation window.

In the next step, the cleansed textual data was processed with Linguistic Inquiry and Word Count (LIWC) 2015, using both the default dictionary of LIWC, and the organizational ambidexterity dictionary developed by Uotila et al (2009). The content of this organizational ambidexterity can be seen in Appendix 2. LIWC is a computer software that analyzes textual data, and provides frequency of words appearing in the text. With both dictionaries, LIWC score demonstrates relationships between word use pattern and thought processes, emotional states, intentions, motives in individual and groups, organizational exploration behaviors, and organizational exploitative behaviors. These scores were used to construct my measurement for BD ambidexterity and other control variables.

### ***Annual Reports.***

Annual reports for all the 25 companies during the 10-year observation window from 2007 to 2016 were gathered, if they were available. A peculiar case concerning two major Chinese manufacturers Vivo and OPPO is that, even though there is evidence to support the claim that Vivo wholly owns OnePlus (a niche company not under the present study's radar), and that Vivo together with OPPO are subsidiaries of BBK Electronics, these companies have denied such claims (Alan F., 2014; Andi, 2016). In addition, Vivo and OPPO do not disclose their financial and operating information, thus when gathering annual reports for these two companies, I used BBK Electronics' data to proxy that of Vivo and OPPO's.

Information provided in the annual reports, however, is not readily available for use. Over the time when I was collecting the annual reports, I detected that companies from different countries, and even same companies in same countries but during different years, used different fiscal calendars. For example, Chinese companies usually report their information using natural year as the fiscal year ended on December 31; Canadian/American companies such as Blackberry use fiscal year ended on February 28 to report their operation in some years, and fiscal year ended September on 30 or on June 30 in other years. This difference in how countries and companies choose to define fiscal year would cause discontinuity problems if not addressed properly. To make the data collected from annual reports more reliable, a considerable amount of effort was



made to transfer all the data into a format fiscal year using the natural year as ended December 31<sup>3</sup>.

One more issue with the annual reports is that these reports use different currencies. To make the material compatible and comparable with each other, all currencies were transformed into USD using the exchange rate provided in the report, or the exchange rate when the annual report was released, if the report itself does not provide such information on the exchange rate between the currency it uses and USD.

### ***Interest Websites.***

Two major websites were used to gather information on cellphone models. Most of the information came from a specific interest website for cellphone products called GSMArena ([HTTP://WWW.GSMARENA.COM](http://www.gsmarena.com)). This website is recognized as one of the key references for the cellphone industry (Giachetti & Marchi, 2010; Giachetti & Dagnino, 2014; Klingebiel & Joseph, 2015). The data was also supplemented by information retrieved from a Chinese based interest website for cellphone products ([HTTP://WWW.CNMO.COM](http://www.cnmo.com)). CNMO.COM's purpose is to offer comprehensive, professional, and accurate news, guide, review, and tutorial on cellphone products; it is proud of its product database, which helped the website to rank top on the Chinese language website that is mobile phone related, according to Alexa industry ranking in August 20, 2016<sup>4</sup>. Data obtained from these two websites covers all 25 companies under the current study over a span of 10 years. It describes how many cellphone models a company put out in a given year.

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<sup>3</sup> If not specifically noted, all the “year” terms in the present study refer to the natural year ended in December 31.

<sup>4</sup> “About CNMO”, retrieved from <http://www.cnmo.com/webcenter/about.html>, May 20, 2017.

## Measures

### *Main Variables*

#### *•Firm performance.*

In the present study design, I refer to firm performance as how well a cellphone manufacturer does in the Chinese market in terms of sales. Specifically, I adopt sales growth rate as the measurement of the firm performance recalling He and Wong (2004), and Lubatkin et al's (2006) study on organizational ambidexterity. This way of measurement is more easily available and reliable than profitability estimates for the present study design, because companies not on the stock market do not submit to financial disclosure regulations, and as the framing of the present study focuses on organizational ambidexterity as demonstrated in the product, sales growth rate is a more natural and direct way of measuring the effects of organizational ambidexterity. Meanwhile, it has been found to be a reliable proxy indicator of other dimensions of superior firm performance (He and Wong, 2004). Data concerning this variable was obtained from Euromonitor's report *Mobile Phones in China, September 2016*. This report provides the number of units sold by each company, this data concerning subject companies was reported yearly from 2007 to 2016, over a span of ten years<sup>5</sup>. Accordingly, year-to-year sales growth was calculated using the following formula:

$$\text{Sales Growth Rate} = \frac{\text{Current Sales} - \text{Last year's Sales}}{\text{Last Year's Sales}} \times 100\%$$

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<sup>5</sup> Note that not all manufacturers are observed throughout this ten year. As a matter of fact, the final dataset was highly unbalanced.

In total, 161 year-to-year sales growth rate scores were obtained, covering 25 companies from 2008<sup>6</sup> to 2016.

### ***BD Ambidexterity.***

The present study defines a cellphone company's BD ambidexterity as a balanced pursuit of organizational exploitation and exploration. Initially, I intended to operationalize BD organizational ambidexterity following He and Wong's (2004) method, to define BD as the absolute difference between the percentage of explorative product and exploitative product a firm has sold at a given time. However, this method proves to be impractical for two reasons. To begin with, market data concerning this method is difficult and costly (although not impossible) to obtain; then, the cellphone model need to be identified as "explorative" and "exploitative", which requires excessive coding work; plus, while one model might be labeled as explorative in the year when it was introduced, it might not be so innovative in the second year, rendering the measurement inaccurate if each product was coded only once throughout observations in different years.

Recognizing the impracticability of applying He and Wong's (2004) way of measurement exactly and directly, this study takes a modified approach to operationalize BD organizational ambidexterity using content analysis (to be precise, Computer Aided Text Analysis), which is a valid approach utilized by a number of organizational ambidexterity studies (e.g., McKenny, Aguinis, Short, and Anglin, 2016; Chatman, Caldwell, O'Reilly, and Doerr, 2013; Uotila, Maula, Keil, & Zahra, 2009). Data that was used to construct this variable resulted from the LIWC content analysis.

In a given year,

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<sup>6</sup> Sales growth rate 2008 refers to sales growth rate as from year ended in December 31, 2007, to year ended in December 31, 2008. It is designated in this way for convenience. Sales growth rate 2008 is matched with data that constitutes other variables gathered in year 2008.

$$AmbiBD = Exploration\ Score \div (Exploitation\ Score + Exploitation\ Score)$$

### ***CD Ambidexterity***

In the present study, CD ambidexterity refers to the combined magnitude of a company's effort in organizational exploitation and exploration. The current study follows He & Wong (2004) and Cao et al's (2009) study and uses the size of product portfolio to measure combined dimension of ambidexterity.

In a given year,

$$CD = \text{Number of models released in current year} \\ + \text{Number of models released the year before}$$

The rationale behind this addition is that cellphones released in a certain year usually sell for around two years before being replaced by new models (Euromonitor, 2017). Thus, a manufacturer's product portfolio consists of models released from both current year and the year before.

### ***Simultaneous Pursuit of BD & CD***

Companies that pursue a high level of BD and CD ambidexterity should see the two dimensions mutually enhance each other. To measure manufacturers' simultaneous pursuit of BD and CD ambidexterity, I first calculated the mean of BD and CD scores, then calculated the difference between the observation and the mean respectively with the score of observation minus the mean, as the procedure of centering these variables. Next, centered BD and centered CD are timed with each other creating the interaction term BD\*CD. Centering these two variables before time them together should minimize the collinearity issue created by multiplication. This way of measurement follows the approach of He and Wong (2004) as well as Cao et al. (2009).

### ***Control Variables***

The following variables were controlled in this study: *Firm Size*, *Firm Age*, *R&D expense*, *Brand Image*, and a dummy variable indicating whether the company brand is *East Asian*

originated. In OLS models, year dummies were automatically generated, with the year 2008 set as the base line and omitted.

**Firm size** is controlled because it is an indicator of how much resources the firm processes and can utilize (Lumpkin & Dess, 2001), and it can also reflect the competitive capabilities of the firm (Miller & Chen, 1996). Following prior studies (Cao et al, 2009; Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro, 2004), the present study measures firm size using the number of full-time employees the firm has. The measurement is log-transformed using Stata's natural log function.

**R&D Expenses.** The present study controls R&D expenses because it was found that the amount of R&D expenses not only affects the product as the outcome, but also influences what types of innovation the company would dedicate its effort to (Cohen & Klepper, 1996). R&D expenses of a manufacturer were extracted from the company's annual report, and were all transformed into USD using the exchange rate when the annual report was released, if the exchange rate were not provided in the report.

**Brand Image.** This study also controls *Brand Image*. Brand Image is an important signal concerning consumers' perception about the brand which is vital in predicting consumer purchase behavior (Keller, 2008). Thus, this variable is deemed necessary to control because it might have an impact on the sales growth rate, which is our dependent variable.

LIWC Sentiment measurement was utilized to proxy *Brand Image* following prior studies (Bian & Montinho, 2011; Mostafa, 2013).

$$\text{Brand Image} = \text{Percentage of Positive Emotion} \div (\text{Percentage of Positive Emotion} + \text{Percentage of Negative Emotion})$$

A summary of variables is listed as below.

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Insert Table 3 about here

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## **ANALYSIS & RESULTS**

### **Analysis on the 1<sup>st</sup> set of Hypotheses**

Using Stata as the tool of analysis, a Bivariate Pearson correlation analysis was conducted to investigate the interrelation between pairs of all the variables. As shown in the correlation matrix displayed in Table 4, a manufacturer's Sales Growth Rate is significantly and positively correlated with BD ( $r = .1385$ ,  $p < .10$ ), significantly and negatively correlated with CD ( $r = -0.1654$ ,  $p < .05$ ), Firm Age ( $r = -0.3475$ ,  $p < 0.01$ ), Firm Size ( $r = -0.1919$ ,  $p < .05$ ), R&D Expense ( $r = -0.1571$ ,  $p < .05$ ). No evidence from the correlation analysis can suggest that Sales Growth Rate was affected by BD\*CD, Brand Image, and EA ( $p > .10$ ). However, the interface correlations between EA and FirmAge, and R&D and FirmSize are significant and above 0.65, indicating that the estimates might be subject to multicollinearity issue (Tabachnick and Fidell 1996, p. 86).

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Insert Table 4 about here

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To diagnose the multicollinearity issue, I first performed an Ordinary Least Squares(OLS) regression on all the test variables, then utilized the regression results to get diagnostic statistics. The Variance Inflation Factor check indicates that the VIF values of all the variables are below 10, however, the “rule of the thumb” using VIF=10 as a threshold has been critiqued as not entirely reliable (O'Brien, 2007). Acknowledging the small size of observations, the current study employed a more rigorous diagnose approach using the correlations of estimated coefficients. In Table 5 the Correlation of Estimated Coefficients reveals pairs of coefficients with high correlations, indicating possible collinearity problems between R&D and Firm Size, EA and Firm Age (Williams, 2008).

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Insert Table 5 about here

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Meanwhile, a Breusch-Pagan/Cook-Weisberg test points out the data is heteroskedastic ( $\chi^2 = 95.35$ ,  $p < 0.00$ ). To tackle this issue, Stata's [robust] option for regression with robust standard errors was employed to address this issue in all the OLS and fixed effect models in the following procedures. Table 8 shows the OLS regression results for testing whether there is a positive relationship between sales growth rate and 1a)BD, 1b)CD, 1c) simultaneous pursuit of BD and CD.

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Insert Table 6 about here

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Model 1 from Table 6 reports the base model where only the control variables are included in the regression. Results from this model suggests that there is significant relationships between Sales Growth Rate and Firm Age ( $b = -1.85$ ,  $p < .01$ ), R&D expenses ( $b = 7.28$ ,  $p < .05$ ), Brand Image ( $b = 269.8$ ,  $p < .10$ ), and whether the firm is East Asian or not ( $b = -88.75$ ,  $p < .05$ ). The impact of Firm Size on Sales Growth Rate is not significant ( $b = 7.28$ ).

BD and CD variables were added in in Model 2. The relationship between BD ambidexterity and Sales Growth Rate is found to be significant and positive ( $b = 134.40$ ,  $p < .10$ ), which provides support for my hypothesis H1a. However, the analysis donated an insignificant correlation between CD ambidexterity and Sales Growth Rate ( $b = -0.07$ , failing to support my hypothesis H1b. Meanwhile, it is worth noting that Brand Image became insignificant when BD and CD were added in ( $b = 214.10$ ).

Model 3 from Table 6 displays the results with the interaction term of BD\*CD added into the regression equation. The results reveal a significant and positive relationship between BD ambidexterity and Sales Growth Rate ( $b = 162.10$ ,  $p < .05$ ), supporting hypothesis H1a. The



insignificant correlation between CD ambidexterity and Sales Growth Rate ( $b = -0.08$ ) again failed to support hypothesis H1b. The relationship between the interaction term and Sales Growth Rate was found not to be significant albeit being positive as predicted ( $b = 0.74$ ).

Comparatively, as an attempt to improve the model fit, I employed fixed effect regression on Year with robust standard errors to test hypothesis H1a, H1b, and H1c, the result of which is displayed in Table 7. This is because the fixed-effect model allows us to remove the potential confounding effects of both observed and unobserved time-invariant confounders from our panel data analysis, given that the effects of these confounders on the response remain constant over time (Fitzmaurice, Laird, & Ware, 2011, p. 337). F-tests show that the addition of the fixed-effect significantly affected the model fit ( $\text{Prob} > F = 0.0012, 0.0001, 0.0000$  for Model 1, 2, and 3 from Table 7 respectively).

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Insert Table 7 about here

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Model 1 from Table 7 lists the results with only control variables in the equation. Compared to Model 1 from Table 6, the estimated coefficients and significance of these variables stay the same. However, EA does become insignificant with the introduction of fixed effect ( $b = -88.75$ ).

Model 2 from Table 7 reports results with BD and CD added into the previous model. Neither BD ( $b = 134.40$ ) nor CD ( $b = -0.07$ ) seem to have significant effect on the dependent variable. At the same time, Brand Image has become insignificant ( $b = 213.10$ ) compared to the base model 1 from Table 7, constant with the change between OLS Model 1 and Model 2 from Table 6. In general, this model does not provide support for my hypotheses.

Model 3 from Table 7 reports the test results on all three hypotheses H1a, H1b, and H1c. Evidence is found to support H1a as the correlation between BD ambidexterity and Sales Growth Rate is positive and significant ( $b = 162.1, p < .10$ ). Constant with the OLS model 1 in Table 6,

this model does not provide evidence for a positive relationship between Sales Growth Rate and BD ambidexterity ( $b = -1.76$ ), or the simultaneous pursuit of BD and CD ( $b = 0.74$ ).

Overall, the analytical results on organizational ambidexterity and organizational performance provide strong support for a positive and significant correlation between BD ambidexterity and Sales Growth Rate, in line with the reasoning for H1a. No evidence was found across the models to support a positive and significant relationship between Sales Growth Rate and CD ambidexterity (H1b), or the simultaneous pursuit of BD and CD ambidexterity (H1c).

### ***Robustness Tests***

Recognizing the presence of multicollinearity issues in the data set, I performed robustness tests on the regression models, by dropping some variables that have potentially caused the collinearity.

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Insert Table 8 about here

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The first column from Table 8 presents hypothesis test results for H1a and H1b using OLS regressions with robust standard errors. It can be seen that, after variable Firm Age and Firm Size are dropped from the equation, BD ambidexterity remained a positive and significant impactor ( $b = 162.1$ ,  $p < .05$ ), whereas CD ambidexterity became significant, albeit retaining its negative correlation with the dependent variable ( $b = -0.23$ ,  $p < .05$ ). Results from this model support H1a, but contradicts the direction of CD ambidexterity and Sales Growth Rate as predicted in H1b.

The second model from Table 8 adds the interaction term between BD and CD ambidexterity into the first model in Table 8. The correlation between BD\*CD is found to be insignificant ( $b = 0.99$ ) in the equation, thus failed to support my hypothesis that the simultaneous pursuit of BD and CD ambidexterity positively impacts Sales Growth Rate in the Chinese cellphone market (H1c). The introduction of such an interaction does not change the direction and

significance of coefficients for BD ambidexterity or CD ambidexterity, as the correlation between BD ambidexterity and Sales Growth Rate remained positive and significant ( $b = 191.9$ ,  $p < .05$ ), while the correlation between CD ambidexterity and Sales Growth Rate is still insignificant ( $b = -0.08$ ). In general, this model supports H1a out of all the three hypotheses.

The third column from Table 8 presents the OLS model testing the impact of BD ambidexterity and CD ambidexterity on Sales Growth Rate, with the variable R&D expenses and EA dropped from the equation. There isn't drastic change in the direction of the correlation between BD ambidexterity and Sales Growth Rate, whereas the significance became stronger ( $b = 167.4$ ,  $p < .05$ ), which seemed to suggest that the multicollinearity problem was relieved to some extent. This finding supports my hypothesis H1a in reasoning for a positive relationship between BD ambidexterity and firm performance.

The last model from Table 8 tests all three hypotheses at the same time using OLS regression design, where the robust standard error is applied and E&D expenses and EA dropped. The results indicated a strong and positive impact of BD ambidexterity upon the dependent variable ( $b = 167.4$ ,  $p < .01$ ), which is constant with the proposition in hypothesis H1a. It is worth noting that, compared to the model before variables that potentially led to collinearity issue were dropped, the effect of BD ambidexterity on Sales Growth Rate is more significant (see model in the second column from Table 8); compared with the third model in the same table where the interaction term between BD and CD is not present, the correlation between BD and Sales Growth Rate is also stronger. This is constant with the change brought by the introduction of BD\*CD in previous models.

Comparing the robustness test on the OLS models, before and after the variables that might cause multicollinearity issue were dropped, we can see that there indeed were some changes in the significance of the variables that test my hypotheses. Although there were dramatic changes in how significant these variables were, the coefficients stayed in the same direction, and what is significant remained significant with the hypothesis-testing variables. Therefore, I conclude that the results obtained from OLS models in Table 6 were not extremely robust, but the robustness issue was not serious enough to compromise the models either. It is likely to be a more preferable

way to drop variables that potentially caused the multicollinearity in the OLS models presented in Table 8.

I applied the same procedure for fixed-effect models presented in Table 7. Same sets of variables that were dropped in the OLS model robustness tests above, were likewise dropped from the fixed-effect models as well. Findings of this test are presented in Table 9.

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Insert Table 9 about here

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The first column in Table 9 presents the Year fixed-effect model with robust standard error, and with two variables, namely Firm Size and Firm Age, dropped from the equation. This model is designed to test the relationship between Sales Growth Rate and BD ambidexterity, or CD ambidexterity. It can be noted that with two variables that might have caused multicollinearity excluded, the effect of CD ambidexterity on Sales Growth Rate appears to be negative and significant ( $b = -0.23$ ,  $p < .01$ ), while the correlation of BD ambidexterity with the dependent variable remains insignificant ( $b = 154.7$ ). This finding is quite bizarre as it reveals that, as the level CD ambidexterity raises, the Sales Growth Rate tends to fall, contradicting the reasoning with hypothesis H1b.

The second column in Table 9 reports the test results from Year fixed-effect model with robust standard error. This model dropped Firm Size and Firm Age, and was developed to test H1a, H1b, and H1c altogether. The results demonstrate no significant relationship between the interaction term BD\*CD and Sales Growth Rate ( $b = 0.99$ ), providing no support for hypothesis H1c that simultaneous pursuit would positively impact the performance of a company. The results also demonstrate a negative and significant relationship between CD ambidexterity and Sales Growth Rate, similar to the results from the previous model.

The third model in Table 9 tests the effect of BD ambidexterity and CD ambidexterity on Sales Growth Rate. It employed Year fixed-effect regression with robust standard error, when R&D expenses and EA were dropped from the equation instead of Firm Age and Size. Neither BD ambidexterity ( $b = 167.4$ ) nor CD ambidexterity ( $b = -0.236$ ) is found to significantly impact our

dependent variable. It appeared that dropping the two variables did not change the positivity or significance of coefficients.

The last model follows the design of the third, but has the interaction term between BD and CD added in to test hypothesis H1c with H1a and H1b at the same time. The results suggest a positive and significant relationship between BD ambidexterity and Sales Growth Rate ( $b = 207.6$ ,  $p < .05$ ), providing evidence for hypothesis H1a. The exclusion of R&D expenses and EA did not change the positivity or significance of coefficients.

### **Analysis on the 2<sup>nd</sup> set of Hypotheses**

To test the second set of hypotheses 2a and 2b, on whether East Asian cellphone manufacturers have a higher level of ambidexterity than Non-East Asian cellphone manufacturers do, the observations were pooled together by year, and sorted as East Asian group and Non-East Asian group. Then a Welch's t-test was conducted for BD and CD between these two groups of companies. I used Welch's t-test instead of ordinary t-test because Welch' t-test does not require the equal variance assumption like the ordinary t-test does.

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Insert Table 10 about here

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From Table 10, we can see significant differences in the BD ambidexterity score between East Asian ( $M = 0.585$ ,  $SD = 0.009$ ) and non-East Asian firms ( $M = 0.561$ ,  $SD = 0.011$ ), with  $t(9) = 1.745$ ,  $p = 0.0989$ . Therefore, the results of t-test providence for our reasoning that East Asian firms display a higher level of BD ambidexterity than their non-East Asian counterparts do, supporting H2a.

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Insert Table 11 about here

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From Table 11, it can be seen that there is significant differences in the CD ambidexterity between East Asian firms ( $M = 110.11$ ,  $SD = 27.64$ ) and non-East Asian firms ( $M = 60.40$ ,  $SD = 20.48$ ), with  $t(9) = 4.334$ ,  $p = 0.0005$ . Thus, the results of the t-test on CD ambidexterity is constant with the reasoning that East Asian firms would demonstrate a higher level of CD ambidexterity than the non-East Asian firms do, providing support for H2b.

Overall, results of the Welch's t-tests revealed that East Asian firms indeed demonstrate a higher level of organizational ambidexterity with regard to both the BD and CD dimension in a statistically significant way, supporting hypotheses 2a and 2b.

In general, empirical evidence from the current study supports hypotheses H1a, H2a, and H2b. Balance Dimension of Ambidexterity has a positive impact on cellphone manufacturer's sales growth rate in the Chinese market; East-Asian cellphone firms exhibit a higher level of ambidexterity in both the Balance Dimension and the Combined Dimension. The current study does not find support for the hypothesis concerning the positive correlation between Combined Dimension of Ambidexterity and Sales Growth Rate, nor does it find support for the simultaneous pursuit of BD and CD positively impacting Sales Growth Rate. Surprisingly, the findings suggest a negative correlation between CD ambidexterity and the sales growth rate, contradicting our hypothesis.

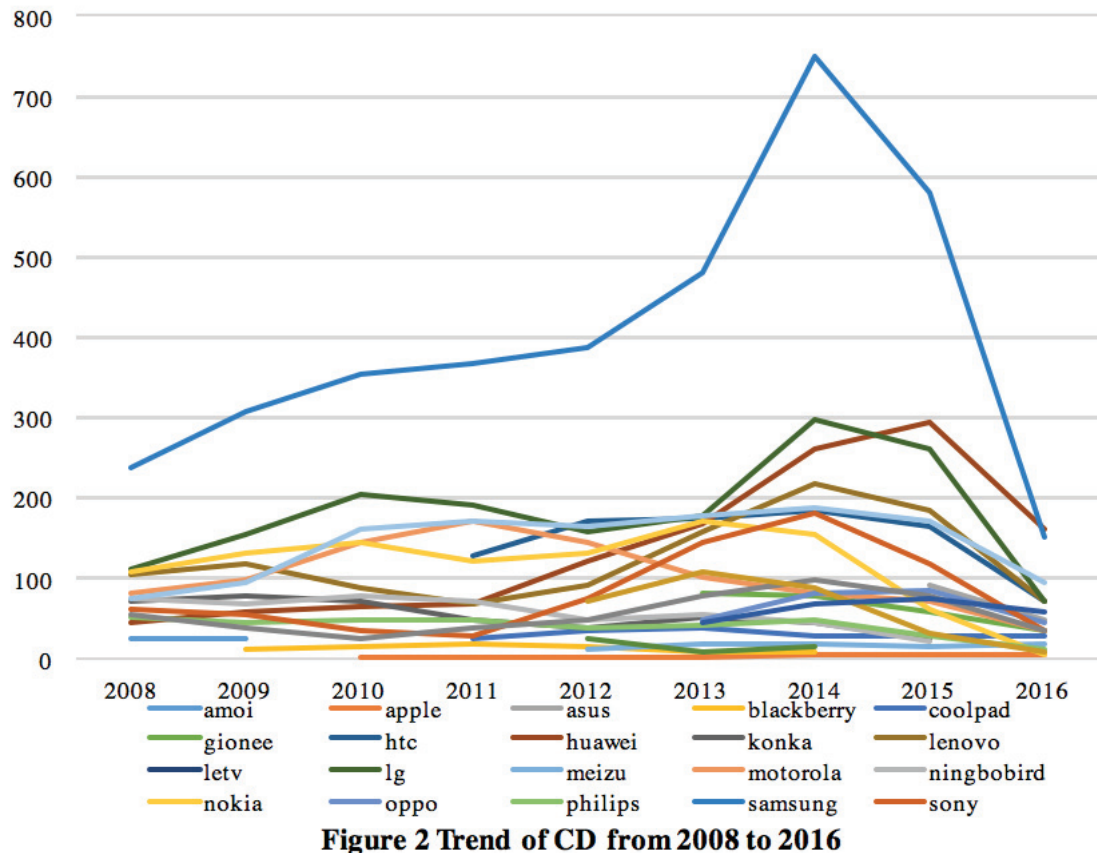
## **DISCUSSION**

The present study is resolved to investigate Organizational ambidexterity's impact on organizational performance, and the differences of level of Organizational ambidexterity between East Asian firms and Non-East Asian firms in the Chinese cellphone market. More specifically, the purpose is to examine these questions from Organizational ambidexterity's both Balance Dimension (BD) and Combined Dimension (CD). To answer these questions, fixed-effect regression models for panel data as well as between group t-test were employed. Not all results are consistent with the hypotheses proposed. All the results are reviewed, and possible explanations for the inconsistency will be provided below.

### **Interpretation of the Results**

In concordance with prior studies on Organizational ambidexterity (He & Wong, 2004; Lubatkin et al., 2006; Cao et al 2009), the results from the present study indicate that BD does have a statistically significant positive impact on cellphone manufacturers' sales growth rate (H1a). Nonetheless, the analysis does not provide enough evidence to support the presence of positive correlation between the simultaneous pursuit of BD, CD, and sales growth rate (H1c). Moreover, the results of all the regressions unanimously reveal a negative correlation between CD and manufacturers' sales growth rate, being the opposite of what is predicted (H1b). This piece of finding is rather bewildering, and was potentially caused by the relatively small number of observations.

Another possible explanation for the negative correlation between CD and sales growth rate, or one can say, the practical interpretation of the explanation provided above, can be attributed to certain manufacturers' configuration of product portfolio being disjointed from the trend of consumers' need. As stated by Euromonitor's report, there has been a growing demand for premium functionality which can only be found in mid-range to high-end smartphones; meanwhile, cellphone manufacturers are slow in responding to consumers' need.



Plotting the volume of CD against time for all companies under the present study, as shown in Figure 2, we can see a trend around 2014-2015 where companies start to reduce their product portfolio. By examining the product portfolio of the manufacturers, it seems that those manufacturers who have a larger product portfolio tend to focus more on the low-end, cheap cellphone models; as the manufacturers reduce the size of their product portfolio, they seem to shift towards higher-priced smart phones with premium features while cutting the low-end phone models. An example provided by the Euromonitor report is that in 2016, although Samsung led the feature phone market with a volume share of 32%, the overall sales of feature phone plunged. Similar situations happened to multiple other players as well, as companies like Konka Group Co Electronics, LG Electronics (China), Ningbo Bird Co and Amoi Electronics Co stopped producing feature phones. Plus, the Euromonitor report states that there has been a lack of differentiation among the local brands. These pieces of evidence all seem to suggest that what matters is not only the sheer volume of CD, but also the quality of CD. There might be a moderating effect of CD's quality on the relationship between CD and sales growth rate uncontrolled for, thus resulting in



the negative impact found in the present study. This, however, certainly can be a topic for future research.

The current study also proposes that East Asian cellphone manufacturers have higher BD Ambidexterity (H2a) and CD ambidexterity (H2b) than their Non-East Asian counterparts. My statistical analysis does provide strong support for these two hypotheses. Notwithstanding the surprising finding concerning H1b, it is probably not unsafe to associate East Asian firm's extraordinary market overtake with its better handling of Organizational ambidexterity.

### **Limitations and Future Research Suggestions**

The present study has several limitations which might provide insights for future research. The first and foremost limitation is the relatively small number of observations (25 manufacturers during a 10-year period, donating 161 observations across nine years). It is possible, albeit hard, to get quarterly data for the current study design. With a larger observation size for the current study design, certain sample bias will certainly be reduced. However, acquiring such a set of data requires substantially more research time and resources.

Another vital limitation lies in the operationalization of Balance Dimension of Ambidexterity. Although the formula used to construct BD was claimed to be “dilemma solving” and “shows great promises for empirical research” by prior research (Uotila et al., 2009), it essentially measures the proportion of exploration against the combined magnitude of exploration and exploitation, differing from the actual definition as an equilibrium between an organization's exploration and exploitation efforts. In a hypothetical situation where 1) the actual BD positively impacts firm performance, 2) and the equilibrium point of BD measured by Uotila et al's formula is 0.65, any BD scores higher than 0.65 should see a negative correlation with the firm performance. As a result, there might be an inverted U-shape correlation between our measurement of BD and firm performance. However, this possible scenario is purely created by how BD is measured, and is not under my research scope, thus the present study does not take this possible scenario into the modeling process. Future studies might need to focus on this specific issue if using the same measurement of BD.

A third limitation is the lack of control for other explaining variables. During the data collection, although I intended to collect data on advertising and promotional expenses, and spent a huge amount of effort trying to collect them, I eventually concluded that it was not even possible to gather enough information to construct dummies variables to measure advertising and promotional expenses. This issue can have a considerable impact on the results, concerning some of the “hottest phone makers” such as Vivo and OPPO used a situation attack strategy in advertising and promoting their products, as their ads are “all over the town” (Eva Dou, 2016, August 11). The study design also does not specifically control historical factors. Events, such as the Samsung Galaxy Note 7 explosion incidents (Gibbs & Yuhas, 2016, September 2), might have a huge impact on the sales. Hopefully, by controlling the Brand Image variable this study design can also control historical factors indirectly to some extent. The panel design and Year fixed effect models can also help to improve the controls.

One factor that this study would have considered but could not, is the product price. Generally speaking, the prices for new phone models based on new technology tend to be high. As new suppliers (greater competition), and even newer phone models based on newer technology enter the market, the prices would certainly fall (IBISWorld, 2016b). The study would donate more meaningful implications for companies to maximize their revenues if it can take the price & cost of cellphones into consideration. Attempts were made to gather data concerning the phone prices using Python 2.7 data mining functions. During the process, the technical specifics of models were gathered, too. Nonetheless, the data mining was not so successful for a few obvious reasons: 1) the prices are consistently changing, 2) interest websites usually do not display prices of models that were ceased, 3) most of the websites do not allow data mining, or have self-protection mechanisms against data mining. Exploratory coding work was done with the limited amount of phone models collected from the mining process, with the hope to identify models as explorative and exploitative. There being approximately 2, 800 models, the coding was deemed to be excessive and has to be stopped, while the coding results were not coherent enough for further treatment. With more resources, time, energy and nothing standing in the way, I hope future research can finish what I started.

## **Practical Implications**

Findings of the present study indicate that organizational ambidexterity was shown to have a significant impact on cellphone companies' sales growth rate. These findings are to some extent consistent with previous studies (Raisch & Birkinshaw's, 2008) in supporting a correlation between Organizational ambidexterity and Organizational Performance. Cellphone manufacturers, as well as companies in other segments of the consumer electronics industry, are encouraged to pay more attention in making themselves more ambidextrous in terms of balancing exploration and exploitation, and as long as appropriately addressing the diversification of their products, they are encouraged to enlarge their product portfolios too.

Regardless of today's cellphone market in China is getting saturated, huge markets in other regions of the world such as in India, Thailand, Mexico, and Brazil. The development of these markets display characteristics similar to that of the Chinese cellphone market from several years ago. This means that these markets are likely to be at a stage where the Chinese market was, and might follow the same market development routine. As a result, the lessons learnt from the Chinese market can be applied to other similar markets.

## **CONCLUSION**

The purpose of the present study was to investigate the impact on Organizational Performance from Organizational ambidexterity in both Balance Dimension and Combined Dimension, in the Chinese cellphone market. The study also compared East Asian and Non-East Asian originated firms' level of Organizational ambidexterity in both dimensions. Mixed findings were made from the analytical results partially supporting that Balance Dimension of Ambidexterity has a positive effect on a firm's sales growth rate. Meanwhile, the findings partially go against the hypothesis that there is positive correlation between Combined Dimension of Ambidexterity and the firm's sales growth rate, which might be a result of several limitations of the present study. The analysis did not find support for the existence of the simultaneous pursuit of BD and CD's positive impact on a firm's sales growth rate, but it did reveal that East Asian cellphone firms demonstrate a higher level of Ambidexterity in both forms, compared to the Non-East Asian companies. Overall, the results support Raisch and Birkinshaw's (2008) conclusion that the relationship between Organizational ambidexterity and Organizational Performance is rather complex. The present study represents an extensive effort to examine Organizational ambidexterity in a practical situation at the company level, and how it affects company's performance in the market. The methodology and findings were discussed and interpreted in a way that shall contribute to future studies and business practices.

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**Table 1 Illustration of Different Conceptualization of Organizational Ambidexterity**

	Exploration Score	Exploitation Score	Assessment of balance dimension of ambidexterity (BD)	Assessment of combined dimension of ambidexterity (CD)
Firm A	10	5	Low	High
Firm B	5	5	High	Low

Note. Reprinted from Q. Cao, E. Gedajlovic, & H. Zhang, *Unpacking Organizational Ambidexterity* (Organizational Science, 2009).

**Table 2 List of Cellphone Manufacturers under Study**

<b>Brand</b>	<b>National Brand Owner</b>	<b>Country of Origin</b>
<b>AMOI (Xiaxin)</b>	Amoi Electronic Co Ltd	China
<b>iPhone</b>	Apple Computer (China) Inc	U.S.
<b>Asus (Huashuo)</b>	AsusTek Computer (China) Inc	Chinese Taipei
<b>Nokia</b>	Beijing Nokia Mobile Telecommunications Co Ltd	Finland
<b>K-Touch (Tianyu)</b>	Beijing Tianyu Communication Equipment Co Ltd	China
<b>OPPO</b>	Guangdong OPPO Mobile Communication Co Ltd	China
<b>HTC</b>	HTC Communication Co Ltd	Chinese Taipei
<b>Huawei</b>	Huawei Technologies Co Ltd	China
<b>Konka (Kangjia)</b>	Konka Group Co Ltd	China
<b>Lenovo (Lianxiang)</b>	Lenovo (China) Ltd	China
<b>LeTv (Leshi)</b>	Leshi Internet Information & Technology Corp, Beijing	China
<b>LG</b>	LG Electronics (China) Co Ltd	South Korea
<b>Motorola (Motuoluola)</b>	Motorola (China) Electronic Co Ltd	U.S.
<b>Bird (Bodao)</b>	Ningbo Bird Co Ltd	China
<b>Philips (Feilipu)</b>	Philips China Co Ltd	Netherland
<b>Blackberry (Heimei)</b>	Research in Motion China Ltd	Canada
<b>Samsung (Sanxing)</b>	Samsung China Electronics Co Ltd	South Korea
<b>Gionee (Jinli)</b>	Shenzhen Gionee Communication Equipment Co Ltd	China
<b>TCL</b>	TCL Corp	China
<b>Vivo</b>	Vivo Communication Technology Co Ltd	China
<b>Xiaomi</b>	Xiaomi Technology Co Ltd	China
<b>Coolpad (Kupai)</b>	Yulong Computer Communication Technology (Shenzhen) Co Ltd	China
<b>Meizu</b>	Zhuhai Meizu Electronic Technology Co Ltd	China
<b>ZTE (Zhongxing)</b>	ZTE Corp	China

Note. Brand name in Chinese Pinyin included in the parentheses, if it differs from its international brand name, to assist in identifying the brand.

**Table 3 Summary of Variables**

<b>Variable</b>	<b>Meaning</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>GrRate</b>	Sales Growth Rate (%)	161	37.81	113.21	-98.4	766.6
<b>AmbiCD</b>	Magnitude of CD Ambidexterity	161	99.22	104.59	2	751
<b>AmbiBD</b>	Magnitude of BD Ambidexterity	161	0.55	0.14	0.01	0.99 -
<b>FirmAge</b>	Firm Age	161	45.07	38.53	2	151
<b>FirmSize</b>	log (Number of employees)	161	10.19	1.57	6.21	12.72
<b>R&amp;D</b>	R&D expense (Unit: 1 billion USD)	161	2.13	2.92	0.07	13
<b>BrImage</b>	Brand Image	161	0.80	0.08	0.42	0.99 -



**Table 4 Correlations of Test Variables**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>GrRate</b>	(1) 1							
<b>AmbiCD</b>	(2) -0.165**	1						
<b>AmbiBD</b>	(3) 0.139*	-0.0111	1					
<b>AmbiBDC</b>	(4) -0.063	0.202**	-0.629***	1				
<b>FirmAge</b>	(5) -0.348***	0.206***	0.093	0.0128	1			
<b>FirmSize</b>	(6) -0.192**	0.462***	0.139*	-0.055	0.557***	1		
<b>R&amp;D</b>	(7) -0.157**	0.567***	0.118	0.100	0.537***	0.671***	1	
<b>Brlmage</b>	(8) 0.051	0.034	0.196**	-0.154*	-0.050	0.192**	-0.175**	1
<b>EA</b>	(9) 0.067	0.212***	-0.129	0.0958	-0.6694***	-0.231***	-0.258**	0.204***

Note. Dummy variable Year is omitted from the table.

\* Correlation is significant at the .1 level (2-tailed).

\*\* Correlation is significant at the .05 level (2tailed).

\*\*\* Correlation is significant at the .01 level (2tailed).

**Table 5 Correlations of Estimated Coefficients**

		(1)	(2)	(3)	(4)	(5)	(6)
AmbiCD	(1)	1					
AmbiBD	(2)	0.0453	1				
FirmAge	(3)	-0.1952	0.0677	1			
FirmSize	(4)	-0.1336	-0.0217	-0.2357	1		
R&D	(5)	-0.4494	-0.1128	-0.1347	-0.4693	1	
BrImage	(6)	0.0171	-0.1961	-0.1105	-0.4136	0.3837	1
SEA	(7)	-0.4835	0.1268	0.6655	0.0134	0.0977	-0.2335

Note. Results obtained using [vce, corr] code from Stata.

**Table 6 Testing Results on 1<sup>st</sup> Set of Hypotheses from OLS Models**

	Model 1	Model 2	Model 3
Model Type	OLS	OLS	OLS
VARIABLES	GrRate	GrRate	GrRate
FirmAge	-1.854 (0.455)***	-1.755 (0.449)***	-1.764 (0.451) ***
FirmSize	-7.595 (8.201)	-7.234 (8.072)	-6.233 (8.825)
R&D	7.280 (2.822)**	7.578 (3.493)**	7.084 (4.017)*
BrImage	269.8 (141.1)*	214.1 (145.2)	207.8 (149.4)
EA	-88.75 (39.50)**	-70.38 (40.73)*	-70.60 (40.99) *
AmbiCD		-0.068 (0.085)	-0.078 (0.083)
AmbiBD		134.4 (71.96)*	162.1 (80.05)**
AmbiBD*CD			0.742 (1.477)
Year Dummy	Yes	Yes	Yes
Constant	59.48 (84.23)	15.60 (81.72)	-2.698 (81.31)
Observations	161	161	161
R-squared	0.270	0.295	0.296

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 7 Testing Results on 1<sup>st</sup> Set of Hypotheses from Fixed-Effect Models**

	Model 1	Model 2	Model3
Model Type	Fixed-Effect	Fixed-Effect	Fixed-Effect
VARIABLES	GrRate	GrRate	GrRate
FirmAge	-1.854 (0.604) **	-1.755 (0.597) **	-1.764 (0.598) **
FirmSize	-7.595 (9.659)	-7.234 (9.190)	-6.233 (9.535)
R&D	7.280 (2.909) **	7.578 (3.558) *	7.084 (3.853)
BrImage	269.8 (126.1) *	214.1 (139.8)	207.8 (142.1)
EA	-88.75 (56.42)	-70.38 (57.47)	-70.60 (57.87)
AmbiCD		-0.068 (0.051)	-0.078 (0.060)
AmbiBD		134.4 (85.80)	162.1 (74.32) *
AmbiBD*CD			0.742 (1.544)
Constant	33.52 (64.83)	-11.95 (66.24)	-29.72 (72.55)
Observations	161	161	161
R-squared	0.217	0.243	0.245
Number of Year	9	9	9

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 8 Robustness Test Results for OLS Models**

	Model 1	Model 2	Model 3	Model 4
Model Type	OLS	OLS	OLS	OLS
VARIABLES	GrRate	GrRate	GrRate	GrRate
FirmAge			-1.080 (0.205) ***	-1.102 (0.210) ***
Size			0.090 (7.419)	0.987 (7.631)
R&D	-0.782 (3.296)	-1.071 (3.420)		
Brlmage	21.76 (132.1)	22.11 (132.4)	49.55 (142.5)	47.90 (142.5)
EA	41.29 (23.31) *	40.83 (23.35) *		
AmbicD	-0.226 (0.101) **	-0.236 (0.098) **	-0.112 (0.087)	-0.135 (0.089)
AmbibD	154.7 (76.41) **	191.9 (85.42) **	167.4 (73.08) **	207.6 (75.83) ***
AmbibD*CD		0.990 (1.399)		1.107 (1.339)
Year Dummy	Yes	Yes	Yes	Yes
Constant	-68.73 (97.31)	-87.52 (97.72)	-21.13 (87.45)	-48.33 (87.55)
Observations	161	161	161	161
R-squared	0.152	0.155	0.252	0.256

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 8 Robustness Test Results for OLS Models**

**Table 9 Robustness Test Results for Fixed-Effect Models**

	Model 1	Model 2	Model 3	Model 4
Model Type	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect
VARIABLES	GrRate	GrRate	GrRate	GrRate
FirmAge			-1.080 (0.201)***	-1.102 (0.598)**
FirmSize			0.090 (7.530)	0.987 (7.430)
R&D	-0.782 (3.740)	-1.071 (3.685)		
Brlmage	21.76 (123.9)	22.21 (125.3)	49.55 (154.1)	47.90 (154.9)
EA	41.29 (35.75)	40.83 (35.29)		
AmbicD	-0.226 (0.066)***	-0.236 (0.071)**	-0.112 (0.089)	-0.135 (0.090)
AmbiBD	154.7 (88.03)	191.9 (86.48)*	167.4 (92.42)	207.6 (76.32)**
AmbiBD*CD		0.990 (1.417)		1.107 (1.398)
Constant	-72.23 (94.30)	-90.92 (103.3)	-35.64 (73.63)	-62.30 (73.84)
Observations	161	161	161	161
R-squared	0.090	0.093	0.197	0.201
Number of Year	9	9	9	9

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 10 Welch's t-test on BD between EA and NEA Firms**

Firm Group	Obs	Mean	Std. Dev.
NEA	9	0.561	0.011
EA	9	0.585	0.009
Combined	18	0.573	0.008
diff		0.025	
Welch's degrees of freedom = 17.20			t=-1.74
Pr(M_NEA > M_EA) = 0.0494			
Pr(M_NEA = M_EA) = 0.0989			
Pr(M_NEA < M_EA) = 0.9506			

**Table 11 Welch's t-test on CD between EA and NEA Firms**

Firm Group	Obs	Mean	Std. Dev.
NEA	9	60.40	20.48
EA	9	110.11	27.65
Combined	18	85.26	34.80
diff		-49.71	
Welch's degrees of freedom = 16.44			t=-4.33
Pr(M_NEA > M_EA) = 0.0002			
Pr(M_NEA = M_EA) = 0.0005			
Pr(M_NEA < M_EA) = 0.9998			



## Appendix 1 Ambidexterity Dictionary for LIWC

Exploration	Exploitation
explor*	exploit*
search*	refine*
risk*	choice*
experiment*	production*
play*	efficien*
flexib*	select*
discover*	implement*
innovat*	execut*

**Note.** Uotila, J., Maula, M., Keil, T., & Zahra, S. A. (2009). Exploration, exploitation, and financial performance: analysis of S&P 500 corporations. *Strategic Management Journal*, 30(2), 221-231.

**Original Note.** The wildcard “\*” can represent any characters.

## Appendix 2 Sample Article from Factiva

[Start of the sample article]

*Amaravati Tab*

*Apple's iPhone, iPad a big hit this holiday season*

*THE HANS INDIA*

*244 words*

*30 December 2016*

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*The holiday season was a big hit for **Apple's iPhone**, as Yahoo-owned research firm Flurry revealed that during the critical shopping period between December 19 to 25, **Apple's iPhone** and **iPad** accounted for 44 per cent of all mobile activations much higher than **Samsung**.*

*The research firm also revealed that **Samsung** saw its many devices combine to account for 21 per cent of all activations during the period, while **Huawei** was in third place with three per cent market share, followed by several other manufacturers, including **LG** and **Amazon**, at two per cent share each.*

*According to a report in the Fortune on Thursday, **Apple** appears to be the single leader during the last week of holiday shopping as the data shared by the Flurry gives a picture from December 19 only, therefore not offering any clear idea about the rest of the holiday shopping season.*

*"Part of **Apple**'s troubles in 2016 might have been a shift in how consumers are spending money on new mobile devices. Between December 19 and 25, full-size tablets like the iPad Pro or iPad Air 2 only accounted for 9 per cent of all mobile device purchases.*

*In 2013, their share of sales stood at 17 per cent," the report added. According to Flurry, **Google** could not crack into the list of top mobile device manufacturers this year.*

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[End of the sample article]